

An Overview of the Dynamic Information Architecture System: A Flexible Object-Based Software Framework for Modeling Complex Environmental Systems

Dr. Jayne Dolph
Argonne National Laboratory

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Environmental systems can be characterized by the interplay of diverse natural and anthropogenic processes interacting across a range of spatial and temporal scales. Understanding these complex systems requires understanding the integration of physical, chemical, and ecological processes and relationships. Modeling and simulation is a common approach to evaluating potential impacts of different environmental scenarios associated with complex ecological systems. The challenge in developing such integrated approaches is to assemble a simulation system that can successfully capture the dynamics of complex environmental systems, and an even more serious challenge to be able to adapt such a simulation to shifting and expanding analytical requirements and contexts.

To address these needs, Argonne National Laboratory (ANL) has developed the Dynamic Information Architecture System (DIAS). DIAS is a flexible, extensible, object-based framework for developing and maintaining complex multidisciplinary simulations of a wide variety of application contexts. Because DIAS is explicitly designed to be context-neutral, it supports simulations in essentially any domain. DIAS application areas to date include dynamic terrain- and weather-influenced military unit mobility assessment; integrated land management at military bases; a dynamic virtual oceanic environment; clinical, physiological and logistical aspects of health care delivery; avian social behavior and population dynamics; and studies of agricultural sustainability under environmental stress in ancient Mesopotamia. An overview of the DIAS architecture and examples of environmental applications developed in DIAS will be presented.